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Contributor Okay let's move away from somebody whom nobody wanted to admit being influenced by to someone who had a very great and overt influence in 17th century science. Robert Boyle, probably one of the two greatest scientists of the century along with Isaac Newton, certainly in Britain.

Boyle was interested in chemistry, he worked in Oxford. And in trying to make sense of chemical behaviour he speculated that material substances are composed of lots of corpuscles, like atoms. He didn't use the word atom. Why not? Well the word atom was associated with atheism, with Epicureanism and Lucretianism going back to the ancient world. So he preferred the word corpuscularism.

His theory was that substances are composed of little lumps of stuff. The shapes of the lumps might change, the way they're organised; the texture might vary in different substances. But essentially the different chemical properties of different substances are to be explained in terms of their microstructure.

Now very importantly Boyle's theory is different from Descartes. Remember Descartes thought that the essence of matter is extension. Wherever you have extension, wherever you have geometrical size you have matter.

Boyle didn't say that. Boyle drew a distinction between penetrable and impenetrable extension. So, matter has the property of impenetrability. One bit of matter cannot go into another; it will inevitably push it if the two are brought into contact.

But in addition Boyle made room for empty space. So Boyle was happy to accept that the world was not a plenum; that in addition to these material corpuscles that make up the substances we see there are spaces between them, a void.

That makes his theory quite a lot more powerful than Descartes. I mean Descartes' theory is actually rather dubiously coherent if you think about it because if wherever you have extension you have matter then it's hard to see the difference, how you can have a difference between different types of stuff.

If they are all extended and the essence of matter is just extension then it looks like wherever you have a cubic meter of stuff you've got a cubic meter of stuff that's all there is to it, whereas if you're allowed empty space as well then you can see how you can have very easily different arrangements of corpuscles within substances, a kind of atomic theory.

But his theory otherwise is in a similar spirit to Descartes. He draws a distinction between primary and secondary qualities. That name incidentally, primary/secondary, is most famously associated with John Locke. John Locke was very much influenced by Boyle.

So you draw a distinction between the fundamental properties of matter; the extension, the size, the shape, the motion and the secondary qualities that we observe; the colour, the smell, the taste and so forth.

And the explanation of the latter is in terms of the former. The reason why something has the colour that it does is to be explained in terms of the microstructure, the way the corpuscles are arranged, maybe the shape of the corpuscles, the way light bounces off them and so forth.

Okay, let's go back briefly to the heavens. Johannes Kepler was an assistant of a nobleman called Tycho Brahe. Tycho built an observatory which enabled him to observe and note down the motion of the planets over many years to an accuracy far greater than anyone had previously been able to do.

In analysing these results Kepler, after Brahe had died and he'd inherited all this data, Kepler worked out that the best explanation of all this was that the planets, instead of moving in circles or circles round circles, were actually moving in ellipses. So I've drawn a rough diagram at the top right there.

You can see that you've got an oval shape, an ellipse and the Sun is not at the centre of the ellipse, the Sun is to one side. It's a focus of the ellipse. So Kepler worked this out on the basis of observation. If you assume that the planets are moving around the Sun in that way then he found out that the observed motion of the planets fits much better.

He published some tables based on these calculations and they turned out to be 1,000 times better than any previous method, I think about 1,800 times better or something like that. The accuracy was phenomenal compared with anything that had been achieved before.

So inevitably over time, it did take time for people to realise how accurate these tables were, the hypothesis got to be accepted.

Okay, this makes room for Isaac Newton.
